Claims

1. Double-layer capacitor,

- having at least one first (1) and one second electrode (5) with opposite polarity,

- having an electrolyte (20), which is in contact with the electrodes (1, 5),

- wherein the maximum charges of the first and second electrode, which are dependent on the polarity of the electrodes, are matched to one another.

2. Double-layer capacitor,

- having at least one first (1) and one second electrode (5) with opposite polarity,

- having an electrolyte (20), which is in contact with the electrodes (1, 5),

- wherein the electrodes with opposite polarity have different capacitance-forming surfaces.

3. Double-layer capacitor according to the preceding claim,

- wherein the electrodes having opposite polarity have surface areas of different sizes.

4. Double-layer capacitor according to one of claims 2 or 3,

- wherein the electrodes having opposite polarity comprise the same electrode materials and have different masses.

5. Double-layer capacitor according to one of the preceding claims 2 to 4,

- in which the product

$$Q^{+}_{V,max} V^{+} = Q^{-}_{V,max} V^{-}$$

is approximately equal for both electrodes.

6. Double-layer capacitor according to one of the preceding claims 2 to 5,

- wherein the first and second electrode comprise the same electrode material,

- in which the product

$$Q^{+}_{M,max} M^{+} = Q^{-}_{M,max} M^{-}$$

is approximately equal for both electrodes.

7. Double-layer capacitor according to one the preceding claims 2 to 6,

- wherein at least one of the electrodes comprises carbon.

8. Double-layer capacitor according to the preceding claim,

- wherein the electrode is selected from a group of the following electrode materials:

a) carbon powder,

b) carbon fabrics,

c) de-metallized metal carbides,

d) carbon aerogels,

e) graphitic carbon,

f) nanostructured carbon,

g) PVD and/or CVD carbon.

9. Double-layer capacitor according to one of the preceding claims 2 to 8,

- wherein at least one of the electrodes is selected from a group consisting of conductive polymers, conductive ceramics and metals or metal alloys, and has a large surface.

10. Double-layer capacitor according to one of the preceding claims 2 to 9,

- wherein the electrolyte is selected from among: a gel electrolyte, a polymer electrolyte and a liquid gel electrolyte.

11. Double-layer capacitor according to one of claims 2 to 9,

- wherein the electrolyte is an electrolyte solution comprising organic and/or aqueous solvents,

- wherein a separator is disposed between the electrodes.

12. Double-layer capacitor according to the preceding claim,

- wherein the separator comprises paper, polymer membranes or glass fibers.

13. Double-layer capacitor according to one of the preceding claims 2 to 12,

- wherein both electrodes are structured as layers, forming a layer stack of alternating first and second electrode layers with separators disposed between them.

14. Double-layer capacitor according to the preceding claim,

- wherein the stack is rolled into a coil.

15. Double-layer capacitor according to one of the preceding claims 2 to 14, formed as a pseudo-capacitor,

- wherein the two electrodes are either metal oxides or conductive polymers.

16. Use of a double-layer capacitor according to one of the preceding claims in a capacitor battery.

17. Method for reducing the difference between the different maximum charges of a first and a second double-layer capacitor electrode with opposite charge, having the method steps:

A) the corrosion-free potential range of the electrode material is determined relative to a reference electrode;

B) the maximum charge of the first and second electrode, which is part of the respective limits of the corrosion-free potential range, is determined relative to the reference electrode;

C) then the maximum charges of the two electrodes are matched.

18. Method according to the preceding claim,

- wherein, in method step A), a difference in potential between the two electrodes and the reference electrode is set, after which a measurement of the corrosion current between the first electrode and the second electrode, as counter-electrode, at the set potential difference, is performed.

- wherein, in method step B), using the second electrode as counter-electrode, the charge that has flowed into the first electrode until attainment of the upper critical limit potential is determined by integration the charge current, and the same process is repeated for the lower critical limit potential.

19. Method according to one of claims 17 or 18,

- wherein, in method step C), the surface of that electrode whose maximum charge is lower is increased.

20. Method according to claims 17 to 19,

- wherein, in method steps A) and B), the same electrode material with the same dimensions is used for the first and second electrode,

- wherein, in method step C), the mass of that electrode having the lower maximum charge is increased.

21. Method according to one of claims 17 to 19,

- wherein, in method step C), the product of

$$Q^{+}_{V,\max} V^{+} = Q^{-}_{V,\max} V^{-} \text{ or } Q^{+}_{M,\max} M^{+} = Q^{-}_{M,\max} M^{-}$$

is set to be approximately equal for both electrodes.